University of Bahrain

College of Information Technology
Department of Computer Science

ITCS252 Discrete Mathematics
Second Semester 2013/2014
Quiz #1

10/10

ID [redacted] Name: [redacted] Section: [redacted]

Q1: Let p, q, and r be the proposition

p: You have a quiz.
q: You play football.
r: You get A.

Express each of the following into symbolic form.

a) Neither you do not have a quiz nor play football.

$\neg(\neg p \vee q)$ ✓

b) Playing football is necessary for not getting A.

$\neg r \rightarrow q$ ✓

Q2: Let p stands for "I am a CS student", and let q stands for "I take ITCS252". Express the conditional statement $p \rightarrow q$ in English:

(a) Using *necessary*.

taking ITCS252 is necessary for CS student. ✓

(b) Using *implies*.

I am a CS student implies I take ITCS252. ✓

Q3: Write the truth table of $\neg p \leftrightarrow (p \vee q)$

p	q	$\neg p$	$p \vee q$	$\neg p \leftrightarrow (p \vee q)$
T	T	F	T	F
T	F	F	T	F
F	T	T	T	T
F	F	T	F	F

✓

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ITCS252 Discrete Structures
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Quiz #2

10/10

ID [redacted] Name: [redacted] Section: [redacted]

Q1. Let $D = \{-1, 0, 1, 2\}$. Fr each statement, what is the truth value. Give reasons.

(a) $\forall x \in D: \ (x \leq 0) \wedge (x \geq 2)$

False.

counterexample $x = -1$; $-1 \leq 0$ but $-1 \not\geq 2$ ✓

(b) $\exists x \in D: \ x^2 < x$

False.

For All D, there is no number that $x^2 < x$

$(1 \not< -1, \ 0 \not< 0, \ 1 \not< 1, \ 4 \not< 2)$ ✓

Q2. Let $b(x)$: "x is a boy", $g(x)$ "x is a girl", and $t(x)$: " x plays tennis".
Express the following statements in symbolic form using *only* the predicates $b(x), g(x)$, and $t(x)$.
The domain is P, the set of all people.

(a) Every girl plays tennis.

$\forall x \in P: g(x) \rightarrow t(x)$ ✓

(b) All boys and girls do not play tennis.

$\forall x \in P: (b(x) \wedge g(x)) \rightarrow \neg t(x)$ ✓

(c) Some boys do not play tennis.

$\exists x \in P: b(x) \wedge \neg t(x)$ ✓

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Quiz #4

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ID: [redacted] Name: [redacted] Section: [redacted]

Q1. Use truth tables to show whether the following argument is valid or not.

$$\begin{array}{l} p \rightarrow q \\ \neg r \vee \neg q \\ \hline \therefore \neg p \end{array}$$

$(p \rightarrow q) \wedge (\neg r \vee \neg q) \wedge r \equiv \neg p$

p	q	r	¬p	¬q	¬r	p → q	¬r ∨ ¬q	① ∧ ② ∧ ③
T	T	T	F	F	F	T	F	F
T	T	F	F	F	T	T	T	F
T	F	T	F	T	F	F	T	F
T	F	F	F	T	T	F ✓	T ✓	F
F	T	T	T	F	F	T	F	F
F	T	F	T	F	T	T	T	F
F	F	T	T	T	F	T	T	T ←
F	F	F	T	T	T	T	T	F

≠

∴ Not valid

critical rows ?

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ITCS252 Discrete Structures
Second Semester 2013/2014
Quiz #4

10/10

ID: [redacted] **Name:** [redacted] **Section:** [redacted]

Q1. Use *Proof by Contradiction* to prove that if n is divisible by 3, then $n^2 + 3n$ is divisible by 9.

Hypothesis: n is divisible by 3

conclusion: n^2+3n is divisible by 9

Proof by Contradiction:

Suppose not. Suppose there exist a number n such that it's divisible by 3 and n^2+3n is not divisible by 9. ✓

by definition $n = 3k$, $k \in \mathbb{Z}$.

$\therefore n^2+3n = (3k)^2 + 3(3k) = 9k^2 + 9k$

$= 9(k^2+k)$, let $w = k^2+k$

$= 9w$ (contradiction) ✓

$w \in \mathbb{Z}$

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Quiz #5

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ID: [redacted] **Name:** [redacted] **Section:** [redacted]

(1) List the elements in each of the following sets:

(a) $\{x \in \mathbf{Z}^+ \mid x + y = 3 \text{ for some } y \in \mathbf{Z}\}$ = {1, 2, 3, 4, 5, 6, ...} ✓

(b) $\{x \in \mathbf{R} \mid x^2 = -5\}$ = {∅}

(2) For $A = \{a, \{b\}, c, \{a, b\}\}$, find

(a) $A - \{a, b\}$ = {{b}, c, {a, b}} ✓

(b) $\{\varnothing\} - A$ = {∅}

(c) $\{a, b, c\} - A$ = {b} ✓

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ITCS252 Discrete Structures
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Quiz #6

9.5 + 0.5 / 10

ID: [redacted] Name: [redacted] Section: [redacted]

Q1. For an integer $n \geq 1$ use mathematical induction to prove that

$$2+4+6+\cdots+2n = n^2+n$$

1) Basis step:

RHS $= (1)^2 + 1 = 2$ true

LHS ?

2) Assumption: $n = k$

$2+4+6+ \cdots +2k = k^2+k$ ✓

3) Induction: $n = k+1$

$2+4+6+ \cdots +(2k+2) = (k+1)^2+(k+1)$ ✓

LHS $= 2+4+6+\cdots+2k+(2k+2)$

$= k^2+k+2k+2$

$= k^2+k+2k+2+1-1$

$= k^2+2k+1+k+1$

$= (k+1)^2+(k+1) =$ RHS ✓